CLAIMS

What is claimed is:

1   1.   A method for recalibrating a sense amplifier during a sense of a selected

2   memory cell, comprising:

3   measuring a physical property of the selected memory cell to produce a first

4   measurement;

5   comparing the first measurement to a first range, wherein the first range is indicative

6   of a short circuit or an open in the selected memory cell;

7   halting the sense of the selected memory cell if the first measurement exceeds the first

8   range;

9   comparing the first measurement to a second range, wherein the second range is a

10   predetermined range signifying a recalibration of the sense amplifier may be necessary;

11   proceeding with the sense if the first measurement is within the first range and the

12   second range;

13   repeating the steps of measuring and comparing for a predetermined number of

14   iterations, if after each iteration, the measurement exceeds the second range but is within the

15   first range; and

16   recalibrating the sense amplifier, if after the predetermined number of iterations, the

17   measurement still exceeds the second range but is within the first range.

1   2.   The method of claim 1, wherein the predetermined number of iterations is one.
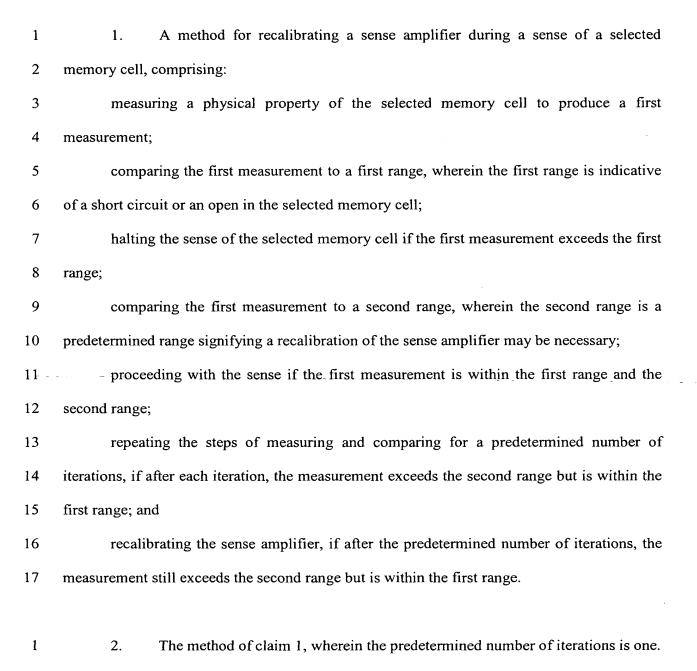
1   3.   The method of claim 1, wherein the measured physical property is any one of

2   the following: voltage, current, power dissipation, time to discharge, and time to charge.

1   4.   The method of claim 1, further comprising:

2   incrementing a counter after each iteration, wherein the counter stores the number of

3   completed iterations.

1   5.   The method of claim 1, further comprising:

2   repeating the steps of measuring and comparing for a second predetermined number

3   of iterations, if after each iteration the measurement exceeds the first range; and

4   halting the sense, if after the second predetermined number of iterations the

5   measurement still exceeds the first range.

1   6.   A method for testing for needed recalibration of a sense amplifier during a

2   sense of a resistance value of a selected memory cell, the method comprising:

3   defining an average time value indicative of averaged time values for each of a

4   selected set of memory cells, wherein the resistance of each cell of the selected set of cells is

5   connected in series with a selected pre-charged capacitance, and with present operating

6   parameters of the memory cell array applying;

7   determining a time value indicative of the discharge time of the selected capacitance

8   upon connection to the resistance of the selected memory cell;

9   calculating a difference value by comparing the time value to the average time value;

10   halting the sense of the selected memory cell if the difference value exceeds a first

11   range;

12   redetermining the time value and recalculating the difference value if the difference

13   value is within the first range but exceeds a second range;

14   recalibrating the sense amplifier if the recalculated difference value still exceeds the

15   second range; and

16   proceeding with the sense operation if the difference value or the recalculated

17   difference value is within the second range.

1   7.   The method of claim 6, wherein the step of redetermining the time value and

2   recalculating the difference value is performed one time before the step of calibrating is

3   performed.

1   8.   The method of claim 6, wherein the step of redetermining the time value and

2   recalculating the difference value is performed at least one time before the step of calibrating

3   is performed.

1   9.   A method for increasing the quality of sensing during a read on a memory cell,

2   the method comprising:

3   sensing a parameter of the memory cell;

4   comparing the parameter to a threshold to determine whether the parameter is valid;

5   enabling a sensing procedure upon determining the parameter is valid; and

6   enabling a response procedure upon determining the parameter is not valid.

1   10.   The method of claim 9, wherein the response procedure comprises:

2   halting the read; and

3   facilitating recalibration of sensing equipment configured to perform the sensing.

1   11.   The method of claim 10, wherein the response procedure further comprises:

2   reattempting the sense prior to recalibration of the sensing equipment to test for false

3   negatives.

1   12.   The method of claim 10, wherein the response procedure further comprises:

2   reattempting the read upon recalibration.

1   13.   The method of claim 9, wherein the sensing procedure is a triple-sensing

2   destructive read procedure.

1   14.   The method of claim 9, wherein the memory cell is a memory cell of a

2   magnetoresistive random access memory (MRAM) device.

1   15.   The method of claim 9, wherein the parameter is the resistance of the memory

2   cell.

1   16.   The method of claim 9, wherein comparing the parameter to a threshold

2   comprises:

3   comparing the parameter to a variable threshold.

1   17.   A sensing system for sensing a state of a memory cell, the system comprising:

2   means for sensing a parameter of the memory element;

3   means for comparing the parameter to a first range to determine whether the

4   parameter is valid;

5   means for performing a sensing procedure upon determining the parameter is valid;

6   and

7   means for performing a response procedure upon determining the parameter is not

8   valid.

1   18.   The system of claim 17, wherein the means for performing the response

2   procedure comprises:

3   means for comparing the parameter to a second range, whereby the second ranges

4   indicates an erroneous memory cell;

5   means for initiating the means for sensing to repeat sensing of the memory cell; and

6   means for facilitating recalibration of the means for sensing if the repeat sensing of

7   the memory cell determines the sensing to still be invalid.

1   19.   The system of claim 18, further comprising:

2   means for tracking a number of iterations of sensing and re-sensing performed by the

3   means for sensing; and

4   means for terminating re-sensing upon reaching a predetermined number of iterations

5   of re-sensing.

1   20.   A program for sensing a state of a memory element, the program being stored

2   on a computer-readable medium, the program comprising:

3   logic configured to enable sensing of a parameter of the memory element;

4   logic configured to compare the parameter to a first range and second range to

5   determine whether the parameter is valid;

6   logic configured to enable a sensing procedure upon determining the parameter is

7   valid;

8   logic configured to re-enable sensing of the parameter of the memory element upon

9   determining the parameter is invalid; and

10   logic configured to facilitate recalibration of sensing equipment configured to perform the

11   sensing, upon re-sensing the parameter for a predetermined number of iterations.